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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

VELASQUEZ, VANESSA T

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/540,662	Applicant(s) SHAPOVALOV ET AL.	
	Examiner Vanessa Velasquez	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 36-44 and 46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 36-44 and 46 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 14, 2009 has been entered.

Status of Claims

Claims 1-36 and 45 are canceled. Claims 37-44 and 46 are pending and presented for examination on the merits.

Status of Previous Objections

The previous objections to the claims for typographical errors are withdrawn in view of amendments to the claims.

Claim Rejections - 35 USC § 112, Second Paragraph

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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2. Claim 39 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim recites that the temperature of the method of claim 37 is maintained in a certain range, but it does not indicate with specificity which step of claim 37 is at the claimed temperature. Thus, the claim is indefinite because it is unclear to which step the temperature is attributed. For the purposes of examination, the Examiner will interpret the temperature to correspond to the temperature in the oxidation reactor during the step of sulfide oxidation.

Applicant is reminded that any changes made to overcome this rejection must be supported by the original disclosure and may not introduce new matter.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 37-39 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider et al. (US 4,834,793).

Regarding claims 37-39 and 46, Schneider et al. teach a process of extracting metal from its ore. The ore may be a sulfidic compound (col. 2, lines 53-58). In one embodiment, aqueous slurry is mixed with aqueous nitric acid in a reactor **10** containing surface agitators **20** (col. 3, lines 22-24; FIG. 1). The reaction of nitric acid and slurry produce sulfuric acid in the same reactor **10** (col. 3, lines 45-50). The resulting mixture from reactor **10** is transported to vessel **40**, where Ca(OH)_2 is added to remove sulfate ions (SO_4^{2-}) by the precipitation of gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). The oxidation reaction is exothermic and may generate enough heat to increase the temperature of the reactor **10** up to 105°C (col. 4, lines 6-9), which overlaps the claimed range. The overlap between the ranges taught in the prior art and the claims is sufficient to establish a *prima facie* case of obviousness (MPEP § 2144.05 Section I).

With regard to the characteristics of the slurry, it is possible for the solids to have a concentration in the slurry of between 40% and 50% in order to enable easy feeding of the slurry into the reactor (col. 9, lines 31-35), which converts to a 1.5:1 and 1:1 liquid-to-solid ratio, respectively. Any extra heat produced by exothermic reactions may be harvested to run other processes (col. 2, lines 11-15).

With regard to the absence of the formation of elementary sulfur during the neutralizing step, Schneider et al. teach that the exiting slurry from the neutralization step “can contain” sulfur (col. 8, lines 39-43), but does not teach that it necessarily must form. Therefore, Schneider et al. still teach all the claim limitations. In addition, it is established that sulfur-containing compounds are hazardous to the health of humans and animals as well as the environment. Therefore, it would have been obvious to one of ordinary skill in the art to minimize or totally eliminate the formation of sulfur in the neutralization step because of its toxicity and negative effects on the environment.

With regard to the oxidation of NO, the NO formed in the oxidation reaction is contacted with oxygen to produce higher oxides of nitrogen having chemical formula N_xO_y (col. 2, lines 38-42). In the case that x and y are 2 and 3, respectively, the higher oxide of nitrogen would be N_2O_3 . Note that “higher oxides of nitrogen” would include, but not be limited to, compounds such as N_2O_4 , N_2O_5 , N_3O_4 , etc. Therefore, this limitation is satisfied.

With regard to the claimed “regeneration oxidizer,” Schneider et al. teach that regeneration primarily takes place in the reactor **10** (col. 10, lines 7-10), but acknowledges that regeneration may be carried out in a separate chamber in order to

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harness the large amount of heat produced by the exothermic oxidation reaction (col. 4, lines 58-68 to col. 5, lines 1-4). Separation of the sulfide oxidation and NO regeneration reactors may also be necessary depending on certain processing conditions such as the amount of ore fed into the reactor **10** (col. 4, lines 58-63). In any case, the final products of the regeneration step are returned to the slurry in reactor **10** (col. 4, lines 13-16; col. 7, lines 49-53).

Still regarding claim 46, Schneider et al. are silent as to the temperature at which the regeneration step is performed. However, Schneider et al. teach that the large amounts of heat produced by the regeneration reaction may be used to provide thermal energy to other parts of the process (col. 5, lines 1-4). Recovering the extra heat generated in the reaction would lower the temperature of the reaction vessel. Schneider et al. further teach that NO oxidation occurs instantly at 25°C and slows down at much higher temperatures (col. 10, lines 49-51). Therefore, it would have been obvious to one of ordinary skill in the art to lower the regeneration temperature to around room temperature (25°C) for the purpose of reducing the time consumed by the regeneration step as taught by Schneider et al.

7. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider et al. (US 4,834,793), as applied to claim 37 above, and further in view of Somers et al. (US 2,315,988).

Regarding claims 40 and 41, Schneider et al. teach that NO is formed with sulfuric acid from the sulfide oxidation reaction in reactor **10** (col. 3, lines 45-50).

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Schneider et al. also teach that oxidation of NO to higher oxides of nitrogen may also take place in reactor **10** (col. 2, lines 38-42; col. 4, lines 26-41). Air, which naturally comprises nitrogen gas, is also circulated therein (col. 4, lines 29-32). Therefore, higher oxides of nitrogen, nitrogen gas, and sulfuric acid are contained in the same enclosure and would necessarily be in contact with one another.

Schneider et al., however, do not teach denitrating the sulfuric acid thermally or chemically. Somers et al. teach that sulfuric acid having a concentration greater than 85% (claim 1) can be denitrated by the addition of ferrous sulphate and heating the mixture to a temperature of up to 100°C (col. 1, lines 53-55 to col. 2, lines 1-3; col. 3, line 55 to col. 4, lines 1-4), which lies within the claimed range. Somers et al. also disclose that reducing agents aid in the removal of nitrogen oxide from sulfuric acid solutions (col. 1, lines 6-10). Sulfuric acid is used in scrubbing gases and is ideally free of nitrogen oxides due to their corrosive properties (col. 3, lines 5-13). Therefore, it would have been obvious to one of ordinary skill in the art to denitrate the sulfuric acid in Schneider et al. using the process of Somers et al. because of the corrosiveness of nitrogen oxide compounds.

8. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider et al. (US 4,834,793), as applied to claim 37 above, and further in view of Kamiyama et al. (US 4,999,173).

Regarding claim 42, Schneider et al. do not teach absorbing nitrogen in a copper salt solution and denitrating said solution. Kamiyama et al. teach a copper-containing

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zeolite catalyst for decomposing nitrogen oxides of the form NO_x . (Note that for $x=1$, the compound would be NO .) The catalyst may be made from any water-soluble copper salt, including salts containing monovalent copper (Kamiyama et al., col. 3, 28-30, 44-45). Nitrogen oxide is decomposed when the catalyst has a temperature between 200°C and 1000°C (Kamiyama et al., col. 4, lines 59-62). Because Kamiyama et al. do not teach denitration in a vacuum, the process is interpreted to occur in air, which contains nitrogen gas. Although the copper on the catalyst is in the solid phase, one of ordinary skill in the art would expect the solution form of copper to be able to decompose nitrogen oxide because the solution phase would have the same chemical makeup as the solid phase. The decomposition of nitrogen oxides is desirable because they are polluting agents that have deleterious effects on the environment (Kamiyama et al., col. 1, lines 12-17). Thus, it would be obvious to one of ordinary skill in the art to incorporate the catalyst of Kamiyama et al. into the process of Schneider et al. in order to remediate the harmful nitrogen oxide gas produced in the hydrometallurgical process of Schneider et al.

9. Claims 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider et al. (US 4,834,793) in view of Kamiyama et al. (US 4,999,173), as applied to claim 42 above, and further in view of Kawasumi et al. (US 4,450,188).

Regarding claims 43 and 44, Schneider et al. in view of Kamiyama et al. teach that ammonia molecules on the catalyst act to reduce bivalent copper to monovalent copper (Kamiyama et al., col. 4, lines 15-22), but do not teach the specific claimed

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reducing agents. However, hydrazine, one of the claimed reducing agents, is known in the art as a reducing agent, as evidenced by Kawasumi et al., wherein aqueous hydrazine is added to copper powder in order to prevent the copper from oxidizing (col. 7, lines 7-13). Therefore, it would have been obvious to one of ordinary skill in the art to utilize a reducing agent such as hydrazine in the process of Schneider et al. in view of Kamiyama et al. because hydrazine prevents the formation of oxides, as taught by Kawasumi et al., thereby allowing the copper surface to be free of contaminants and available for catalytic use.

Response to Arguments

Applicant's arguments filed January 14, 2009 have been fully considered but they are not persuasive.

First, Applicant primarily argues that neither Schneider nor Frankiewicz teach sending N_2O_3 into the oxidation reactor from outside. Upon further review of Schneider et al., Frankiewicz appears to no longer be needed to sustain a rejection of the "outside" limitation of the claim. Schneider et al. teach that regeneration primarily takes place in the reactor **10** (col. 10, lines 7-10), but acknowledges that regeneration may be carried out in a separate chamber in order to harness the large amount of heat produced by the exothermic oxidation reaction (col. 4, lines 58-68 to col. 5, lines 1-4). Separation of the sulfide oxidation and NO regeneration reactors may also be necessary depending on certain processing conditions such as the amount of ore fed into the reactor **10** (col. 4,

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lines 58-63). In any case, the products of the regeneration step are returned to the slurry in reactor **10** (col. 4, lines 13-16; col. 7, lines 49-53).

Second, Applicant argues that the separation steps of claims 40 and 42 are not taught or suggested in the prior art of record. In response, once the nitrogen oxide and nitrogen gases recited in the claim are exposed to the sulfuric acid and copper denitrating substances, the separation of the nitrogen oxide gas from the nitrogen gas would be expected to occur due to the inherent nature of the chemical reaction. Therefore, separation is implied by the processes of the prior art of record.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Velasquez whose telephone number is 571-270-3587. The examiner can normally be reached on Monday-Friday 9:00 AM-6:00 PM ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached at 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/
Supervisory Patent Examiner, Art
Unit 1793

/Vanessa Velasquez/
Examiner, Art Unit 1793